

Bayesian Statistics and MCMC

Postgraduate Course

School of Applied Mathematical and Physical Sciences

Introduction to Bayesian thinking. Bayesian Statistics and Probability. Informative and non-informative prior distributions. Conjugate priors. Statistical modelling and prior compatibility. Sufficiency. Posterior distribution. Bayesian estimation. Bayesian interval estimation and hypothesis testing. Bayesian predictive distribution.

Introduction to MCMC. Stochastic simulation. Markov chains. Metropolis Hastings algorithm. Gibbs sampler. Examples using R. Introduction to Winbugs. Diagnostic tests using CODA. MCMC in generalized linear models.

Bibliography:

1. Bernardo, J.M. and Smith, A.F.M. (1997). *Bayesian Theory*. Wiley, Chichester.
2. De Groot, M.H. (1970). *Optimal Statistical Decisions*. McGraw-Hill, New York.
3. Carlin, B.P. and Louis T.A. (1996). *Bayes and Empirical Bayes Methods for Data Analysis*. Chapman and Hall, New York.
4. Chen, M., Shao, Q. and Ibrahim, J.G. (2000). *Monte Carlo Methods in Bayesian Computation*. Springer, New York.
5. Christensen, R., Johnson, W., Branscum, A. and Hanson, T.E. (2011). *Bayesian Ideas and Data Analysis. An Introduction for Scientists and Statisticians*. Chapman and Hall, New York.
6. Gamerman, D. and Lopes, H.F. (2006). *Markov Chain Monte Carlo: Stochastic Simulation for Bayesian Inference*. Chapman and Hall, New York.
7. Gelman, A., Carlin, J.B., Stern, H.S., Dunson, D.B., Vehtari, A. and Rubin, D.B. (2013). *Bayesian Data Analysis, Third Edition*. Chapman and Hall, New York.
8. Gilks, W.R., Richardson, S. and Spiegelhalter, D.J. (1995). *Markov Chain Monte Carlo in Practice*. Chapman and Hall, New York.
9. Marin, J.-M. and Robert, C.P. (2007). *Bayesian Core. A Practical Approach to Computational Bayesian Statistics*. Springer, New York.
10. Ntzoufras, I. (2009). *Bayesian Modeling using WinBUGS*. Wiley, Hoboken, N.J.
11. Robert, C.P. (1996). *The Bayesian Choice - A Decision Theoretic Motivation*. Springer Verlag, New York.
12. Chen, M., Shao, Q. and Ibrahim, J.G. (2000). *Monte Carlo Methods in Bayesian Computation*. Springer, New York.